UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/718,667	11/22/2000	Niklas Stenstrom	45051-00006	2452

7590 12/03/2003

Gerald T. Welch
Jenkens & Gilchrist, P.C.
3200 Fountain Place
1445 Ross Avenue
Dallas, TX 75202-2799

EXAMINER	
TRAN, KHANH C	

ART UNIT	PAPER NUMBER
2631	6

DATE MAILED: 12/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/718,667	STENSTROM ET AL.	
	Examiner	Art Unit	
	Khanh Tran	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 November 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *7-11* is/are allowed.

6)☒ Claim(s) *1-4, 6, 12-13, and 15-16* is/are rejected.

7)☒ Claim(s) *5 and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *6*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11/24/03 MK

1. Claims 1-4, 6, 12, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art in the instant application in view of Khayrallah U.S. Patent 6,263,030 B1.

Regarding claim 1, figure 2 of prior art in the instant application discloses a communication receiver 200 including a channel estimator 230 adapted to provide a channel estimate of the communication channel based on y_t, an equalizer 240 adapted to estimate a sequence of transmitted symbols and provided a sequence of decided symbols based on the received signal and the channel estimate, a channel tracker 250 adapted to update the channel estimate based on y_t and the decided symbols to supply the updated H_t to the equalizer 240. Admitted prior art, however, does not show a controller operatively coupled to the equalizer and the channel tracker, and wherein the controller is adapter to receive channel quality as claimed, and wherein the enabling control signal is adapted to switch the channel tracker from a disabled state to an enabled state. Khayrallah invention is directed to an equalizer with channel tracker switching in another US patent. Figure 4 illustrates a demodulator/equalizer 74 including a Maximum Likelihood Sequence Estimator (MLSE) 84, a first high speed channel

tracker 86, a second low speed tracker 88, an error control decoder 90 and a tracker choice block. Khayrallah further teaches that in operation, the first channel tracker 86, and the second channel tracker 88 can be tuned to different speeds. Hence, it would be apparent to one of ordinary skill in the art that if the first channel tracker 86 is tuned to a high speed, while the second channel tracker 88 is tuned to static (no moving), meaning there is no updated channel estimate produced by the second channel tracker 88. One would have a case very similar to the claimed application. The error control decoder 90, corresponding to the controller as claimed in the instant application, is coupled to the MLSE estimator 84 and the channel trackers 86, 88 through the tracker choice 92. The error control decoder 90 receives the estimator metric signal 96, outputted from the MLSE estimator 84, and produces a second state reliability signal 102 if the estimator metric signal 96 is above a threshold value; otherwise, the error control decoder 90 produces the first state reliability signal 102. The reliability information signal 102 instructs the tracker choice block 92 to activate a trigger 104 to switch between the channel trackers 86, 88. As recited above, in the case of static where the second channel tracker 88 would not produce updated channel estimate, the trigger 104 enables the channel tracker 86, corresponding to updated channel estimate is produced, or disables the channel tracker 86, corresponding to no updated channel estimate is produced. Admitted prior art discloses a TDMA receiver utilizing a channel tracker for updated a channel estimate, but lacks means for enabling or disabling the channel tracker. Khayrallah discloses a general case of equalizer with channel tracker switching. It would have been obvious for one of ordinary skill in the art that by

modifying Khayrallah teachings to utilize only one channel tracker for updated channel estimate and incorporating Khayrallah teachings into admitted prior art, one would have a case very similar to the claimed application.

Regarding claim 2, the error control decoder 90 receives the estimator metric signal 96 from the MLSE estimator 84, which receives a received signal 72. It would be apparent to one of ordinary skill in the art that the estimator metric signal 96 represents a degree of correspondence between the received signals and the decided symbols.

Regarding claim 3, admitted prior art in figure 1 discloses the equalizer 140 produces as a second output a qualitative information that is based on a squared distance between the received sequence and the predicted received sequence given the decided symbols. Hence, the claimed limitation has been addressed in admitted prior art.

Regarding claim 4, admitted prior art and Khayrallah do not disclose that the threshold value is stored in an electronic memory operatively coupled to the controller. However, as well known in the art, the threshold value must be stored in the memory; and the act of the error control decoder 90 comparing the estimator metric signal 96 with the threshold clearly implies that the memory is coupled to the error control decoder 90.

Regarding claim 6, figure 3 illustrates a communication system for use with Khayrallah invention wherein the transmitted digital signal 68 is a TDMA signal. It would be apparent to one skill in the art that the receiver 52 is capable of TDMA communication.

Regarding claim 12, said claim is rejected using similar rejection argument of claim 1 since the claimed limitations has been addressed by modifying Khayrallah teachings to utilize only one channel tracker for updated channel estimate. Furthermore, as recited in claim 1, the error control decoder 90 receives the estimator metric signal 96, outputted from the MLSE estimator 84, and produces a second state reliability signal 102 if the estimator metric signal 96 is above a threshold value; otherwise, the error control decoder 90 produces the first state reliability signal 102. Hence, the estimator metric signal 96 is directly associated with the sequence of decided symbols from the MLSE estimator 84. This step corresponds to step (a) as claimed in the instant application. The error control decoder 90 receives the estimator metric signal 96 and produces a second state reliability signal 102 if the estimator metric signal 96 is above a threshold value; otherwise, the error control decoder 90 produces the first state reliability signal 102. That corresponds to step (b) as claimed in the instant application. The reliability information signal 102 instructs the tracker choice block 92 to activate a trigger 104 to switch between the channel trackers 86, 88. And as recited in claim 1, in the case of static where the second channel tracker 88 would not produce updated channel estimate, the trigger 104 enables the channel tracker 86, corresponding to updated channel estimate is produced, or disables the channel tracker 86, corresponding to no updated channel estimate is produced. That corresponds to step (c) as claimed in the instant application.

Regarding claim 13, said claim is rejected using similar rejection argument of claim 3.

11/29/03

2. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrison et al. U.S. Patent 6,370,189 B1.

Regarding claim 15, Morrison et al. discloses in figure 2 a receiver including a maximum likelihood sequence estimation (MLSE) demodulator 32, a delay determination circuit 50, and a channel tracker circuit 52 and a delay determination circuit 50. The MLSE demodulator 32 has a trellis structure. The channel tracker circuit 52 use the tentative decision 36 from the MLSE demodulator 32 to update the channel estimate 39 that is fed back to the MLSE demodulator 32. Hence, this step corresponds to step (a) as claimed in the instant application. The quality output value 38 from the MLSE demodulator 32 is provided to the delay determination circuit 50. The delay determination circuit 50 detects the quality output value 38 and compares with a predetermined acceptance value stored in a memory coupled to delay determination circuit 50. Morrison et al., however, does not explicitly disclose comparing the updated channel estimate with an initial channel estimate. Nevertheless, it would have been obvious for one of ordinary skill in the art that the predetermined acceptance value is based on some initial channel estimate since output of the MLSE demodulator 32 is directly related to the channel estimate. Hence, the step of comparing the quality output value 38 with a predetermined acceptance value stored in a memory obviously implies comparing the quality output value 38, which contains an updated channel estimate, with the predetermined acceptance value, which contains an initial channel estimate. That corresponds to step (b) as claimed in the instant application. If the quality output 38 of the demodulator 32 indicates a low confidence as a result of the comparison step,

the apparatus and method of Morrison et al. teachings do not use the estimate 36 to update the channel estimate 39. Therefore, it would be apparent to one of ordinary skill in the art that no update channel estimate is produced until the quality output value 38 indicates a high confidence value. Hence, the foregoing portion of Morrison et al. teachings correspond to step (c) as claimed in the instant application.

Regarding claim 16, Morrison et al. further discloses that the channel tracker of the present invention may also be used with bi-directional demodulation in which a complete burst having synchronization segments at the beginning and end of the burst is received and demodulation is then performed in a forward direction for a portion of the bits and in a reverse direction for the remaining bits. Morrison et al., however, does not disclose the receiver is capable of TDMA communication. Nevertheless, as well known in the art, burst is a transmitted frame. In TDMA communication system, TDMA signal is divided into a plurality of frames. Hence, it would be apparent to one of ordinary skill in the art that the apparatus as taught by Morrison et al. can be easily configured for receiving TDMA signals.

Allowable Subject Matter

3. Claims 5 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

4. Claims 7-11 are allowed.

Regarding claim 7, said claim is directed to a digital communication receiver/ a method adapted to communicate with a digital communication transmitter across a communication channel. The claim identifies uniquely distinct features "wherein the controller is adapted to compare the updated channel estimate with an initial channel estimate and to supply a disabling control signal to the channel tracker, if the comparison indicates a difference smaller than a predetermined criterion". The closest prior art, Baier (US 5,185,764) and Khayrallah (US 6,263,030 B1) disclosing a similar receiver employing an equalizer, either singularly or in combination, fail to anticipate or render the above underlined limitations obvious.

Conclusion

5 . The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Baier U.S. Patent 5,185,764 discloses "Receiver for Time-Varying Distorted Signals".

Mourot et al. U.S. Patent 5,537,438 discloses "Method of Equalizing a Receive Data Block in a Time-Division Multiple Access Communication System and Receiver Utilizing this Method".

Khayrallah et al. U.S. Patent 6,320,919 B1 discloses "Adaptive Channel Characterization using Decoded Symbols".

Bottomley U.S. Patent 5,499,272 discloses "Diversity for Signals with Multi-path Time Dispersion".

Bottomley et al. U.S. Patent 5,577,068 discloses "Generalized Direct Update Viterbi Equalizer".

Bahai et al. U.S. Patent 6,275,525 discloses "Enhanced Method for Adaptive Equalization Technique in Mobile Wireless Systems.

Bar-David et al. U.S. Patent 6,459,728 B1 discloses "Iterative Channel Estimation".

Sendyk et al. U.S. Patent 5,268,930 discloses "Decision Feedback Equalizer".

Arslan et al. U.S. Patent 6,411,649 B1 discloses "Adaptive Channel Tracking using Pilot Sequences".

Parr et al. U.S. Patent 5,471,501 discloses "Enhanced Digital Communications Receiver using Channel Impulse Estimates".

Morrison et al. U.S. Patent 6,370,189 B1 discloses "Apparatus and Methods for Variable Delay Channel Tracking".

Huszar et al. U.S. Patent 5,862,156 discloses "Adaptive Sequence Estimation for Digital Cellular Radio Channels".

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Tran whose telephone number is 703-305-2384. The examiner can normally be reached on Tuesday - Friday from 08:00 AM - 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 703-306-3034. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9314.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3800.

KCT

11/29/03

KHAI TRAN
PATENT EXAMINER